Drag &Drop, Multiphysics & Neural Net-based Lab-on-Chip Optimization Software, Phase I

Completed Technology Project (2003 - 2003)

Project Introduction

The overall objective of this project is to develop a drag and drop, component library (fluidic lego) based, system simulation and optimization software for entire lab-on-chip systems. Current approaches for biochip system design are either very inefficient (trial-and-error based) or time-consuming (high-fidelity simulation-based). The proposed tool will benefit the biochip community by tremendously shortening design optimization times (minutes). Representation of complex, interacting physico-chemical processes of a biochip in a system design tool is a formidable challenge. Our innovative solution seeks to use state-of-the-art high-fidelity simulations to develop and train Artificial Neural Network (ANN) based models for different components of a biochip. The Phase I effort will focus on proof-of-concept by (a) Development of multiphysics simulation-based ANN models for typical components of a biochip; (b) Demonstration of capabilities of the developed ANN model through optimization of a micromixing biochip. In Phase II, we will further develop and refine ANN models to account for additional multiphysics effects (electrokinetics, biochemistry, etc.) and dynamic response. The final product will feature a comprehensive library of components along with a user-friendly graphical user interface. CFDRC is the technology leader in multiphysics simulations for the biochip industry, and very well placed to successfully undertake this challenging task.

Primary U.S. Work Locations and Key Partners

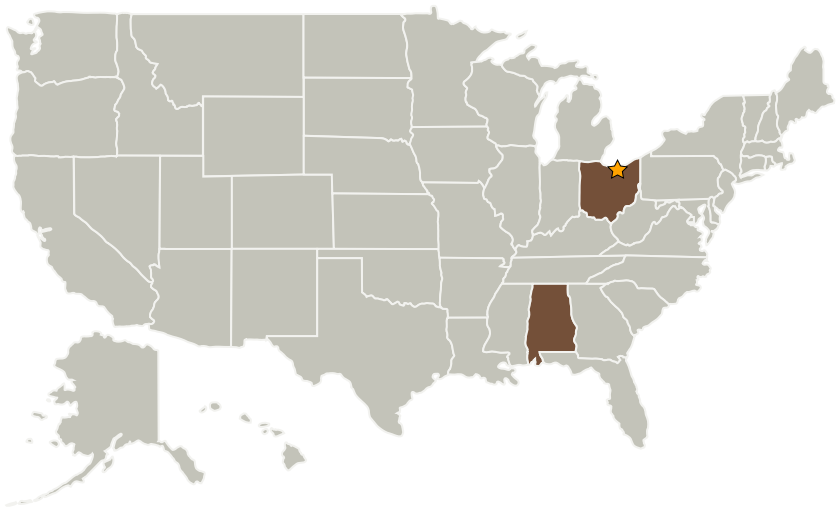

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Ohio

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Project Manager:
Arnon Chait

Principal Investigator:
S Krishnamoorthy

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.5 Thermal Control Analysis